JPRS 80957

2 June 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 105

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 80957

2 June 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 105

CONTENTS

ELECTRONICS

FERRANTI INTRODUCES CAD SYSTEM FOR GATE ARRAYS

Wuerzburg ELEKTRONIKPRAXIS in German Feb 82 p 54

[Text] For its 10th anniversary, Ferranti is introducing an interactive computer-assisted design system for gate arrays, with which LSI [Large-Scale Integration] and VLSI [Very Large-Scale Integration] Uncommitted Logic Arrays (ULA) can be designed, specified and verified.

"Just a few years ago, the number of gates that were integrated into complex circuits was about 800, today it is already 2,000, and soon it will be 4,000 or 6,000." Juergen Rymus, IC marketing manager at Ferranti, offers this for consideration and he thinks that automation is necessary here. The solution for Ferranti is the ULA designer: An automatic development aid which could utilize equally the technical circuit expertise of the user and Ferrant's experience in array technology. In practice, this means that the user completes the entire ULA design phase inside his own four walls with the appropriate technical aids and the verification is carried out by outside specialists. In this way the developer ensures protection for his design.

"The ULA designer is designed for gate arrays with complexities of from 100 to more than 10,000 gates," explained Rymus and added that the annual capacity is set for 40 ULAs with a complexity of 1,000 gates. In the basic version, the ULA designer consists of a PDP 11/23, a graphics screen unit with a keyboard, a digitalizing board, a control desk and an optional plotter.

Ample Software Package

The designer software, backed up by the multiuser and multitask RSX-11M operating system, is composed of the ULA library, the layout, the logic description, the test specification and the transfer process.

The library contains all the necessary information for the design and verification of individual ULA versions. The layout program contains the layout input, the machine drawing and the editing.

An overall check of the test plan is possible as part of the test programs. During the transfer of the data packages from the ULA designer to the CAD center, the system generates check lists to verify that all the information is being transferred with the data packages.

Currently there are already 50 variations of the ULA, but the application software is constantly being expanded.

Over the Telephone into the CAD Center

The software and hardware components mentioned so far together represent the user system configuration. An additional important component of the total system, in which Ferranti's knowhow in array technology has been demonstrated, is the ULA host computer. The ULA designer can communicate over an ordinary telephone line with the host computer in the CAD center in Manchester (England) or Sunnyvale (California).

In Four Steps to the Finished Design

The input of the logic plan is the start of the design process. The second step is the design of the ULA layout, with the help of standard functions and of functional units developed by the user himself. Interactive editing of all errors or changes in the control drawing plotted by the computer can be carried out at the screen terminal. This is followed by the input of the test specification, which is used both for logic verification and for generating the ATE [Automatic Test Equipment]. The fourth and final step is verification of the design. For this, the user transmits the three major blocks, logic, layout and test information, to the host computer, together with sets of commands for logic simulation, layout check and setting up the test program.

Once the design phase is complete, the user can begin the manufacture of masks and prototypes. "And in 3 to 4 weeks after presentation of the logic plan and the layout, the ULA prototypes are available," is Juergen Rymus' answer to the question about the time required.

If the ULA designer is not needed for designs, it can also work as a minicomputer for a laboratory or an office. Compiler and Fortran, Macro and Cobol are available, supported by a text editor and various program libraries.

Code: 417

9581
CSO: 3102/261

ICI DEVELOPS MORE READABLE LIQUID CRYSTAL DISPLAY

Essen ELEKTRONIK-APPLIKATION in German Mar 82 pp 11, 12

[Text] ICI has made a significant improvement in the readability of liquid crystal displays (LCDs) with the development of coloring agents of greater purity for the British Royal Signal and Radar Establishment (RSRE). The colored background now possible increases the contrast and makes superfluous polarizers which limit the viewing angle of conventional LCDs. The results of the work in the ICI laboratories in Manchester will have a significant impact on all forms of electronic visual displays and will probably have special significance for automobile and aircraft instruments.

This form of display is based on the alignment of long chain molecules in an electrical field. A variation in the applied field causes a change in the reflectivity of the liquid. Most passive displays are based on this effect. The special attraction of LCDs is their small energy consumption compared to alternative systems.

A significant deficiency of LCDs is that they have to be viewed almost perpendicularly: From any other angle, they are unreadable. This is due to polarization effects which result from maximizing contrast. Color is seen here as a possible way to circumvent the problem. ICI found a new pigment formula which is specially tailored for coloring LCDs. Success depends on skillful manipulation of the chemical properties of the pigment molecules. Once the pigment is mixed with the liquid crystals, the individual rod-like pigment molecules can be made to rotate throug 90 and to align themselves whereupon they absorb light and become colored. The rods make a polarizer superfluous and thus give a 50 percent greater light intensity. A white display on a colored background formed with these pigments can be read in subdued light and from various angles. The contrast is sharper than that provided by any other process available to date.

9160
CSO: 3102/246

EUROTECHNIQUE MORE SUCCESSFUL THAN PREDICTED

Paris ELECTRONIQUE ACTUALITES in French 5 Mar 82 p 11

[Article by J.P.D.M.: "10 Million CI MOS at Eurotechnique in 1982"]

[Text] Eurotechnique (51 percent Saint-Gobain; 49 percent NS (National Semiconductor)), one of the three foremost MOS/C-MOS integrated circuit semiconductor companies, should produce over 10 million MOS integrated circuits this year, thus exceeding its delivery schedule. Production in 1981 had already reached 2.5 million integrated circuits (essentially during the second half of the year) and had been higher than predicted, this being in any case largely a matter of compensating, through processing volume, for the poor current economic picture and low market prices.

Eurotechnique does not hide the fact that its losses exceeded company projections for 1981 and that profitability for the operation is no longer expected before 1984 (1983 was the forecast in the development plan). However, the company has no turnover figure, its results being consolidated with those of Saint-Gobain. Actually, although company executives are not commenting on the matter, the fate of Eurotechnique, which is 51 percent nationalized Saint-Gobain, is in the hands of the government. Unofficial government plans include separating Saint-Gobain's electronics activities. But will Eurotechnique become part of a holding company combining CII-HB, Olivetti shares, R2E, and Logabax? Will links be established with Thomson (something which Eurotechnique does not seem to want?)

Sixty-five Percent of Turnover for Exportation

Be that as it may, Eurotechnique's goals for 1981 were met, in technical terms. The Rousset center now employs 400 people and its production rate has reached 12,000 4-inch wafters per month. The company relies exclusively on a 3-micron technology comparable to HMOS-1, and since the third quarter of 1981 has been obtaining production yields comparable in order of magnitude to results at the NS plant in the United States. The company claims that its quality control standards match those of its Japanese competitors: less than 500 defective parts per million parts delivered. The exportation goal was also met: 65 percent of deliveries were made abroad in 1981, directly for a large order and through the distribution channels of Germany and England; a sales office has also just opened in San Francisco.

Where products are concerned, the first phase which consisted of establishing a production unit with standard circuits is now complete. Currently in production are the 16K-bits 4116 dynamic memory, the 4K-bits 2147 static memory including the 2147 H/35 ns, the EPROM 2716 and 2732, the 8-bits 8050 microprocessor, and the 4-bits COP 420 with 1K ROM microprocessor.

Eurotechnique must now cross the difficult 1982 threshold when very large scale mass production will be a fact of life while the world economic picture will probably remain poor. For a company with no resales of imported products and subsisting only from its own manufacturing, the strength of the sales network is a fundamental parameter. The company currently has a network of eight distributors in France and will expand during 1982 in 13 countries (four distributors in the United States, two offices and three distributors in Germany, one distributor in Italy, Switzerland, Israel, and Spain, two distributors in Scandinavia and the Benelux countries.) The company thus hopes to retain a turnover percentage of at least 60 percent in exportation. This year, conformity with IBM and Olivetti should follow the already-established conformity with CNET (National Center for Telecommunications Studies) and CII-HB.

Striving for a Coherent Product Line

The company's second goal for 1982 is to offer a coherent line of products. This year, the following N-MOS items will be available: ROM 42716 (16K), 42732 (32K) and 42764 (64K), and EPROM 2764 (64K); at the end of 1982, the 4164 (64K) dynamic RAM and the 2128 (2K x 8) static RAM will also be in production, as will the COP 410/444 and 2440 microprocessors, and the 8048 and 8049. At the end of the year, the NS 800 C-MOS (Eurotechnique's ETC 800) should also be introduced as well as the 16-bits 16032 microprocessor (the NS 800 is compatible with Z 80). Finally, in 1982, the following will appear in the field of telecommunications C-MOS circuits: COFIDEC 5051/5056/5054/5047; a controller; CODEC 5020/5021/5156A; the 5040 filter, and the 5310 modem. At the same time, beginning with the Salon, a European-formula family of cards based on the Z 80 will be marketed, which we will discuss again in the future. For the modst advanced circuits, Eurotechnique will turn to MOS and C-MOS 2-micron technology (the company's first wafer stepper was installed early in 1982).

Five Development Strategies

But the company must also prepare for the future, and in particular must design its own family of circuits which will play an important part in Eurotechnique's catalog for 1985 when the present (renewable) second source contract with NS expires.

A fledgling company like Eurotechnique cannot possibly have a no-holds-barred new products policy. Thus only six strategies have been selected: EPROM memories (the 64K-bits, planned for the end of 1982, will have been designed by the company); EEPROM memories (a two and one-half year program has been formulated for large capabilities; these memories should eventually replace EPROM in 50 percent of applications); specialized microprocessors; telecom

circuits (COFIDEC under contract with DAII, whose first chips are now being tested jointly with NS; T83 circuits; and terminal circuits); N-MOS/C-MOS cards and systems; and finally, pre-diffused C-MOS with two levels of metallization and large capacity, which should go into service late in 1982. This year, Eurotechnique will devote 18 MF to its research and development. (Until now, the creation of Eurotechnique has represented an investment of 200 MF). Jean-Luc Grand-Clement, general director of Eurotechnique, admits that the importance of the company at this point does not allow self-financing for all the research that would be desirable, but he emphasizes that MHS and EFCIS are in the same position and that cooperative research among French semiconductor companies would be in everyone's interest.

11,023
CSO: 3102/206

BRIEFS

THOMSON-CSF 'SPACE' DIVISION--Paris--Thomson-CSF activities in satellite-mounted electronic equipment and systems have reached such proportions that the company has decided to create a Space Division, it was announced in a communique issued on 17 February. The new division, the communique indicates, is responsible for satellite-mounted equipment, for complete payloads, and for space systems which include a satellite. Division headquarters are at Courbevoie and plants headquarters in Velizy. A new center will open in Toulouse in 1983 with 600 employees. Thomson-CSF will then have a modern industrial facility, "practicqlly unique in Europe," for the design, implementation, and integration of payloads for communications, broadcast, and observation satellites. Thomson-CSF will participate "significantly" in the INTELSAT-VI satellite, the largest contract in the history of commercial satellites with its cost of one billion dollars, and which will represent two-thirds of world telecommunications during the next decade. The group will also be general contractor for the TELECOM-1 payloads; this satellite will offer, in 1983, new telematics services to enterprises, representing an order of 300 million francs, while military applications will account for 500 million francs. In addition, the division will provide much of the equipment for the French-German television satellite launched by Ariane in 1985. Thomson-CSF Espace, which will have a 400 million franc turnover this year, employs 600 people and expects to reach 1000 in 1985. [Text] [Paris AFP SCIENCES in French 18 Feb 82 pp 21-22] 11,023

PHILIPS, SIGNETICS, RCA JOINT CMOS--Philips, Signetics and RCA have signed a design and development agreement concerning joint development of a new family of high-speed CMOS circuits whereby each company will supply the same set of approximately 180 circuits. Presently, most electronic data processing installations are built around low-power Schottky chips. The new high-speed CMOS logic will be just as fast as Schottky logic but will require only 1/1000 the power. In addition, CMOS chips are less sensitive to interference so that the potential for errors is reduced. It is estimated that the worldwide market for high-speed CMOS circuits will amount to about 500 million dollars by the mid 1980's. The new circuits will probably be available in the second half of 1982. The agreement includes common development rules and the exchange of tapes for computer-based mask production so that the interchangeability of the high-speed CMOS products is assured. [Text] [Essen ELEKTRONIK-APPLIKATION in German Mar 82 p 13] 9160

CSO: 3102/246

ENERGY

COAL-WATER FUEL TESTED IN SWEDISH DISTRICT HEATING PLANT

Stockholm NY TEKNIK in Swedish 8 Apr 82 p 2

[Article by Hans Werner]

[Text] Upplands Vasby will be the first municipality to test coal-water fuel.

A 25 MW central boiler plant will be driven by coal powder mixed with water during a year-long test.

Negotiations are underway between Nycol and the municipality of Upplands Vasby north of Stockholm. The anticipated result is that a shut-down boiler plant will be used to test the coal-water fuel.

A total of six municipalities are involved in discussions with Nycol concerning the field test. Tests will be conducted only if the Board for Energy Production Research (NE) provides economic support to the municipalities for the tests.

"Mutual interest has been expressed for such cooperation between Nycol and Upplands Vasby," municipal commissioner Jimmy Bjork said. He believes that negotiations may be complete after Easter.

Shut-Down Reserve Boiler

The reason that Upplands Vasby is interested is that the municipality has a 23 MW boiler that has been shut down. It is an extra reserve facility for the municipality's new district heating system which began operating 5 years ago.

"We are also favorably located geographically with respect to Nycol's Sodertorn plant," Jimmy Bjork said.

The test is expected to cost about 2 million kronor, although this will not be paid by the municipality. Too little is known at present about how much reconstruction will be needed at the boiler plant, how much flue-gas purification will be required, and how high fuel costs will be.

The full-scale tests will also reveal the efficiency of such a plant. These questions can be answered only after the test period of about 9 to 12 months.

Whether this project is successful or not, Upplands Vasby eventually must turn to something besides the convenient but expensive oil now used. If the coal-water fuel fulfils all its expectations, it could be the desired alternative.

Heat Pump Plant Studied

Along with these negotiations, the municipality also is studying the possibility of investing in a heat pump plant. The idea is to remove heat from the water of Lake Malaren for the district heating network.

It is estimated that such a station with two heat pumps producing a total of 20 MW would cost between 50 and 60 million kronor. This may be compared to a single new boiler for solid fuel with a power output of 35 MW which today costs 40 million kronor.

Regardless of which alternative to oil is chosen, large investments will be needed. For this reason, low energy costs will be a prerequisite if the alternative is to be economically justifiable for the municipality.

Coal Economical

This municipality's recent status report on energy discusses all possible alternatives. The conclusion is that heat pumps and coal are the best alternatives to oil today.

One conclusion was that if the municipality were forced today to replace oil in its district heating system, which will purchase 14,000 m^3 oil this year, convention coal firing is the only economically feasible alternative.

Another aspect of energy planning in this municipality is that a new electric boiler was purchased last March for the municipal power plant. This was also done to reduce the amount spent on oil. The 12 MW electric boiler makes it possible to utilize inexpensive electricity.

9336
CSO: 3102/269

STUDY SHOWS COAL LIQUEFACTION STILL NOT ECONOMICAL IN FRG

Duesseldorf VDI NACHRICHTEN in German 19 Mar 82 p 5

[Article by Hans Overberg: "Liquefaction of Coal Still a Dream"]

[Text] At the present time and for the foreseeable future, the liquefaction of coal is not economically feasible in Germany. This assessment applies to both German and imported coal. Although a combined coal/residue conversion (residue = topped crude from the refinery) markedly improves the result, it does not decisively affect this outcome. These are the most important key statements made in the study done by Veba Oel AG, Gelsenkirchen, which was elaborated by this firm for the Federal Ministry for Research and Technology. The study extends to a total of 20 volumes.

Hard coal and extra-heavy oil (residue) were considered as input material for the investigated system, with the design being based on a self-sufficiency plan--namely, that gasoline and fuel oil are produced as finished products suited to real market conditions. This plan designated that two of the total of four hydrogenation legs should be capable of being operated with either coal or residue. Designing the integrated plant for the alternative employment of coal and extra-heavy oil has turned out to be impractical, reports Veba Oel, because in that case the plant would have to be provided with about 11 million t/a [tons/year] of refinery residue. But the amounts of products resulting from this (about 8 million t/a) which would have to be further processed externally could not be introduced in nearby refineries without costly renovation measures.

The planning and construction time for such a plant--operating according to the Bergius-Pier process as further developed by Veba Oel into the Veba-Combi Cracking system--would require 8 years and would necessitate about DM 6 billion (1981 price level) of fixed investments. During the construction phase another DM 1.7 billion in taxes and interest would be added, so that the total capital on which interest is paid would come to DM 7.7 billion. This initial cost supposedly includes environmental-protection measures and start-up costs also. The study says that given an inflation rate of 6 percent per year, the total investment increases to DM 9 billion and the total capital on which interest is paid increases to DM 11 billion. It says that 3,000 employees would be needed for the operation of the entire plant, and of these 1,550 would be on the production end.

Probably the most serious matter is the unprofitability associated with a coal hydrogenation process. That is, according to the study an annual subsidy

requirement would arise of DM 1.4 billion if German coal is used. Leaving public assistance out of account, the cost-covering price at the gas pump for gasoline would be 2.20 DM/liter, with a concurrent fuel-oil price of 1.61 DM/l. The study says that if imported coal is used, the annual subsidy requirement decreases to about DM 1.1 billion, the price for gasoline goes down to 2.05 DM/l, and the price for fuel oil goes down to 1.45 DM/l. If two process legs were supplied with extra-heavy oil or residual oil, the annual under-covering of costs would be reduced to DM 0.9 billion with the use of German coal and to DM 0.8 billion in the case of imported coal. If the sole production is that of gasoline from German coal, the subsidy requirement increases to 1.5 billion DM/a, and the gasoline price then amounts to 2.37 DM/liter, inclusive of all taxes and sales expenses.

According to the study, although after a certain period of time positive operating results can be expected, one cannot expect any positive overall balances. It is shown by calculation that with a 7-percent price rise for the input materials and for the fabricated products, when German coal is used no positive operating results are achieved as yet even after 20 years. In the most favorable case--that is, with the use of imported coal and residual oils--positive results are feasible after 7 years, or in other words not until in the eighth year. Assuming a price rise of 7 percent for coal and 8 percent for the products, the study says that with German coal positive operating results are not conceivable until in the 14th year, and with imported coal and residual oil not until in the sixth year of operation. In the case where German coal and topped crude are used, it is true that the receipts would cover the production costs in the seventh year, but the operating losses of DM 6.4 billion accruing by then would remain uncompensated. Only if there are very high returns on the capital in later years could positive interest yields arise, it is said vaguely.

The firm deals exhaustively with possible sites in the FRG, above all in connection with the size and availability of the property, with infrastructure, the environmental situation, political acceptance, and site-specific costs. According to this study, the site of Rheinberg on the left bank of the Lower Rhine would be the most suitable. Even allowing for the handicaps associated with sulfur dioxide and fine dust as well as the noise-control situation, such a large plant is realizable there, the study says, but political acceptance for this site is lacking at present, because the population and the political bodies have refused this. Also rated as favorable for coal hydrogenation is the site of Brunsbuettel on the Lower Elbe, since here only the noise-control measures would require large investments, and only the disposal of effluents would bring particular problems. The investigated site of Dortmund-Ellinghausen (Hoesch property) is practically out of the question because of the poor connections with the transport network (canal). Also unsuitable would be Emden or Luneplate on the Lower Weser.

On the other hand, it seems possible to achieve environmental protection for a large-scale hydrogenation system. For the gaseous and dustlike emissions, the standards based on TA [technical guidelines]-air would not be exceeded. According to the study, the following can be estimated as maximum values from such a plant: SO_2 about 750 kg/h, for NO_x 800 kg/h, for CO about 220 kg/h, for hydrocarbons 300 kg/h, and for dust 140 kg/h. Satisfactory SO_2 values would be achieved if all the furnaces were fired with almost sulfur-free C_1/C_2 gases. The sulfur brought into the hydrogenation plant via the coal and residue is converted into H_2S, and

more than 99 percent of it is changed into elemental sulfur in Claus sytems which have an added-on Scott stage. The study says that the most difficult problem is presented by the noise emissions. It would be possible to adhere to the prescribed limits of the TA-noise only through special protective measures which go far beyond the present state of the art. The paramount consideration above all, says the study, is the distance of the plant from residential areas which are located in the vicinity.

According to the study, after recovery of phenols and ammonia the process water is subjected to a multistage purification process. The quality of the effluent prior to emptying into the drainage canal would correspond to the legal feed-in conditions, the study says. After concentration and centrifuging, the sludge which has accumulated in the effluent-purification process is incinerated in sequential fluidized-bed furnaces. The waste products one would obtain would be primarily solids from the gasification of the hydrogenation residues--consisting of the coal cinders introduced into the process and the one-way catalyst. These solids would be fused by the gasification at 1300°C to 1400°C and would be changed into a vitreous consistency through quenching in a water bath. The granular material thus produced--amounting to between 240,000 t/a and 580,000 t/a, depending on the mode of operation--would have a non-porous surface, and upon being dumped would be neutral with respect to affecting the groundwater.

In summary, the upshot is that an industrial-scale coal hydrogenation is said to require a relatively large area and good connections with respect to transport, so that only a few sites in the FRG would be eligible at all for this purpose. Moreover, the study says that it must be anticipated that the population will have a negative attitude toward it everywhere. There are no major technical problems, although with respect to the further development and optimization of the process some unsettled questions still need to be answered. In the fields of residue treatment and reaction-chamber design, more developmental work has to be done--namely, with respect to a higher specific reactor fuel charge and a higher product yield--so as to achieve a better economic efficiency. The study says that although it is not disputed that such a large-scale plant would bring benefits to German industry as a reference facility, its poor economic efficiency today and in the foreseeable future is the decisive criterion. But in any case, the indicated capital expenditures and operating losses would go beyond the means of a private-sector enterprise.

12114
CSO: 3102/249

BRIEFS

WORLD'S LARGEST BIOGAS PLANT--The world's biggest plant for the production of biogas from material of vegetable and animal origin has become operational at Ismaning near Munich. The plant was built by the engineering and aerospace company Messerschmitt-Boelkow-Blohm with a financial contribution of DM2.5 billion from the Federal Ministry of Research and Technology. The plant will process manure coming from 1,000 head of cattle plus vegetable waste coming from nearby factories. The plant's output capacity will be 4,000-5,000 cubic meters of biogas per day. The gas will be used to generate energy which will supply the local electric power grid. The transformation of gas into methanol, as a fuel for transportation, is also under consideration. The country already has 45 plants in operation for the production of biogas and more than 30 are under construction. The Ministry of Research is also studying an integrated biogas system to be put up at Quickborn, in Bavaria, whose biogas plants are to be connected to some factories. [Text] [Rome NOTIZIARIO DEL CNEN in Italian Oct 81 p 16] 5058

CSO: 3102/265

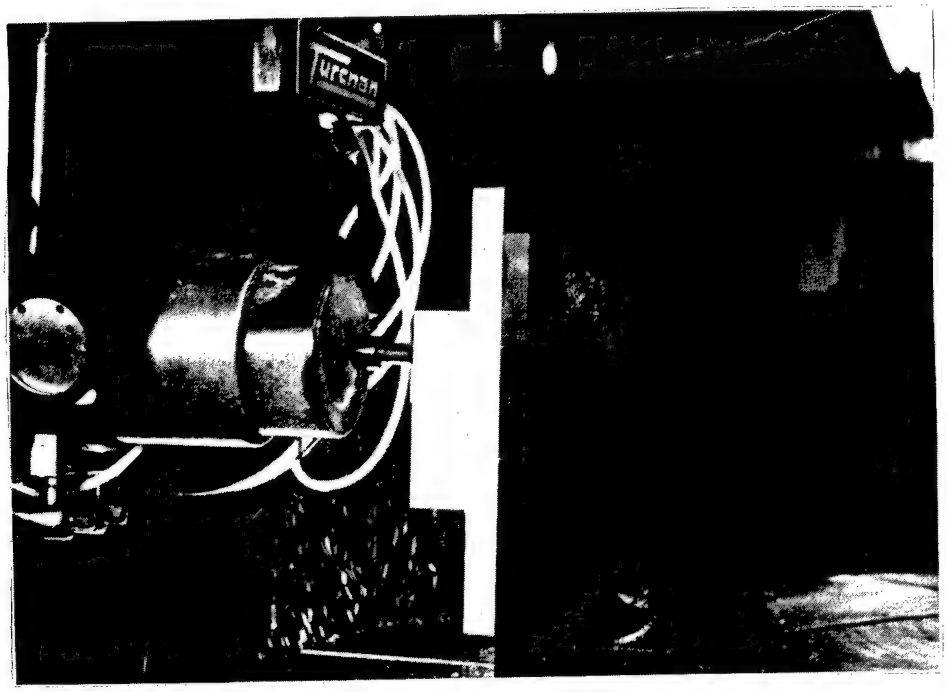
FRENCH FIRMS WORK TO INDUSTRIALIZE VERY HIGH SPEED MACHINING

Paris MACHINE MODERNE in French Mar 82 Supplement pp 15-17

[Article by Nicole Beauclair: "Tomorrow: Very High Speed Machining"]

> [Text] It is coming out of the laboratory to face industrial reality. Very high speed machining (TGV) is making its first appearance in aeronautical applications, but there are still many details to be worked out, particularly with regard to the drive mechanism and tooling.

In this article we shall barely touch on the technology of electrospindles in energized magnetic bearings inasmuch as that was taken up in several articles in MACHINE MODERNE (No 815 of May 1977 and No 842 of January-February 1980). However, we believe it worthwhile to call attention to their industrial applications, particularly in the machining area. For at present, although TGV machining has been extensively written up, it seems that many problems are not yet resolved and that we cannot expect production applications before the end of 1983.



The development of TGV machining involves intricate problems with regard to the technology of electrospindles. (Doc. S2M)

Energized magnetic bearings were put on the market in 1977, and their development led to the subsequent development of a whole range of electrospindles aimed at developing TGV machining. The perfection of such a machining procedure involves close collaboration by several technical associations.

First, the manufacturer of the electrospindle, the Magnetic Mechanics Company (S2M), the builders of machine tools, the manufacturers of cutting tools, the machine tool users (presently, the greatest application for this procedure is in aeronautics), but also the manufacturer of numerical controls. From this we can see how difficult it is to assemble all the necessary information and production parameters to get such a procedure into operation.

Mr Dussaux, general manager of S2M, recently explained the use of electrospindles on PMAs (energized magnetic bearings) for TGV machining. First, let us recall that increased cutting speeds offer a number of advantages, the most important of which are increased productivity, a reduction in cutting effort and improvement in the cutting surface. However, the development of TGV machining involves intricate problems with regard to the technology of the electrospindles which must be capable of very high rotating speeds while having strong motorization at their disposal.

Conventional electrospindles equipped with oil bearings or pillow blocks are not capable of simultaneously attaining this double objective and either favor speed to the detriment of power or the reverse. Moreover, their rigidity, on which precision depends, is not very great.

This discovery, according to Mr Dussaux, led to the work of developing and perfecting electrospindles equipped with energized magnetic bearings, a work in which S2M has been engaged for the past 3 years.

In fact, this type of bearing, in which the rotating part is suspended without mechanical contact (therefore, without friction) thanks to magnetic forces and electronic servomotors, permits rotating speeds which are almost double those obtained with ball bearings for the same shaft diameter, does not wear, does not need lubrication and consumes little power. To these advantages, which result from the absence of mechanical contact, we may add the advantages produced by electronic servomotors: automatic rotor balancing by rotation around the axis of inertia, extreme rigidity and the possibility of knowing the position of the rotor in the air gap and the stress on the bearings at any time.

As we shall see later, experiments are underway and, very fortunately, technicians are developing, from the same model, assemblies like the B 10/1000 which furnishes an effective power of 15 kW at 60,000 rpm. (The B 5/1250 furnishes a power of 5 kW at 75,000 rpm and the B 20/500 furnishes an effective power of 20 kW at 30,000 rpm.)

The PMA electrospindle comprises:

--The electrospindle proper with integrated slip-ring motor and magnetic suspension, the spindle being fixed on the machine frame with a cheek or flange. A cone arrangement and adjustable bear for holding the cutting tools keep the electrospindle extremely rigid and provide for easy automatic tool change;

--Electronic servomotor and control of magnetic suspension;

--Static frequency converter to power the tool-feed motor.

Provision for cooling the motor is assured by water circulation for the stator and pressurized air for the rotor. The controls can be operated from an electronic panel or from a remote control box; and the connection with the machine's numerical control can be thus accomplished providing for a high degree of flexibility in operating the machine. Several milling experiments have been made during the past few years, and some are now underway in France (at S2M and TMI Forest), the FRG and the United States (particularly at Boeing).

Experiments at S2M

As we have said, to our knowledge all experiments are being made with a standard electrospindle developing a power of 15 KW at 60,000 rpm. The tool is fixed in the nosepiece of the electrospindle with a slightly angled cone specially developed for high speed; a flexible adjustable bar holds the tool right regardless of speed of rotation. The magnetic bearings of the electrospindle are controlled by an S2M electronic servomotor panel.

Since TGV machining requires tool feeds of 10 to 20 meters per minute, the S2M experiments are being conducted on a lathe simulating a milling operation. The solution to the problem of feeds consists in using a large-diameter disk (1 to 1.5 meters) of the material to be machined and securing it in a large-capacity lathe chuck. The electrospindle carrying the milling tool is then mounted on the lathe carriage.

The rate at which the piece is fed past the milling cutter is obtained by taking the speed of rotation of the lathe and the diameter of the piece being machined (for example, machining a 1-meter diameter with the piece rotating at 5 rpm gives a feed of $95 \times \pi \times 5$, or 15.7 meters per minute). This solution has the advantage of great flexibility in regulating the amount of feed and makes it possible to do surface or contour work.

Moreover, thanks to the lathe's automatic crossfeed, it is also possible to make lengthy machining cuts, essential conditions for obtaining stabilized parameters for measuring cutting power and stress, and also essential for an initial approach concerning the life of the cutting tools.

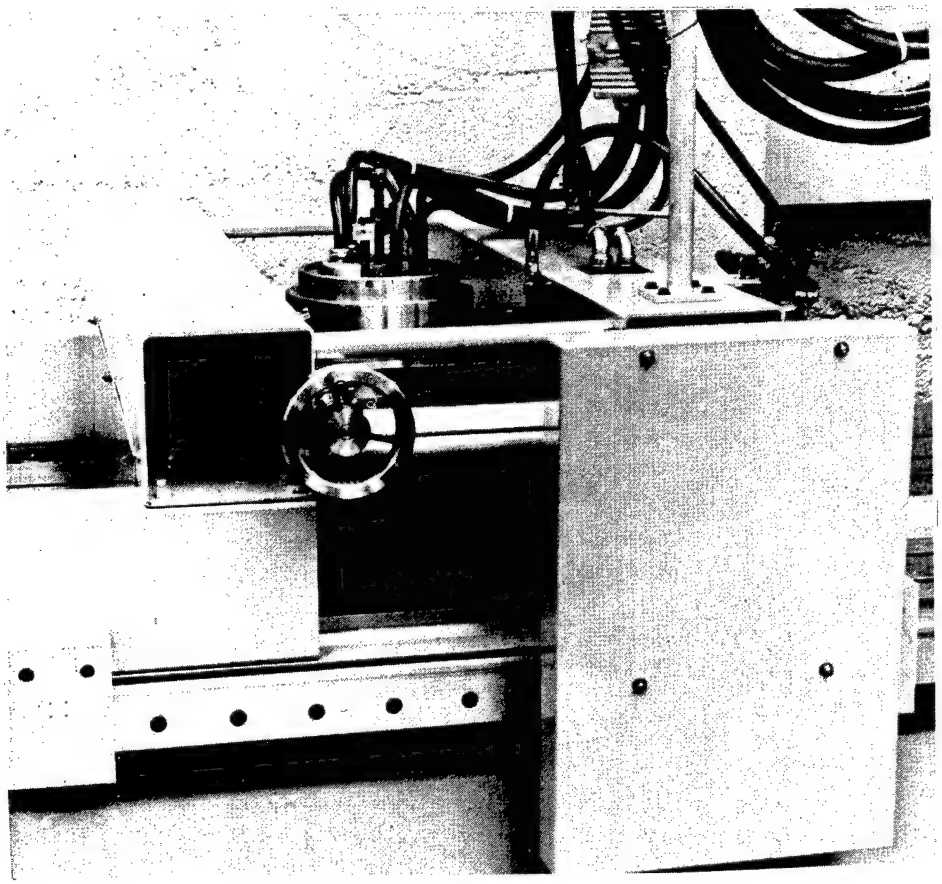
To get back to aeronautical machining conditions, the disks machined during the experiments are in AU4 GT4 aluminum using Rito tools, one or two-sided helical carbide milling cutters with the following characteristics: 10 degree cutting angle, 12 degree and 18 degree angles for the first and second clearances, 23 degree spiral and 25 mm diameter.

In this type of experiment the motor's static feed converter is of Jeumont-Schneider construction with 30 KVA power and a maximum frequency of 1,000 Hz, enabling the electrospindle to accelerate or brake in less than 10 seconds. An electric control panel is equipped with an interface normally connected to the CN [numerical control] of the machine being used. In addition to the information necessary for safe use of the electrospindle, this device also makes it

However, even though Mr Dussaux thinks these results and those obtained in the FRG and the United States have convinced him that TGV machining is now a reality, it seems that much is still to be done in order for this method to be used industrially. We ask nothing more than the details furnished by TMI.

From Laboratory to Industry

In Capdenac, the conservative approach is mandatory. Since 1979, TMI has been equipped with an electrospindle to verify the influence of TGV machining on yield and the interest this cutting technique might have on various types of machining (aeronautical and automotive parts). The trials being made in Capdenac are being conducted with the aid of the Dassault Company which, recently and jointly with TMI, gave Anvar a research and development file on TGV machining. The program includes a study of cutting techniques, the development of a numerical control device and servomotor with special shafts for contour cutting at 20 meters per minute and, lastly, the designing of a pilot machine specially made for TGV cutting.



The lathe carriage is supported on a cushion of air thus eliminating friction and permitting rapid tool feeds. (Doc TMI)

The first trial runs made with the B 10/1000 electrospindle soon made it apparent that it was almost impossible to verify the data. The problem was not simple, according to Pierre Tillement and Andre Greffiez, chief engineer and research head at TMI respectively since the feed frequency is 1,000 Hertz and one finds harmonics up to 25,000 Hz and above. For that reason, TMI first made it a point to obtain means for precisely measuring the power consumed. This was accomplished with a two-directional spectroanalyzer and, by having the analyzer record an image of the current and the stress of the feed on the motor, one obtains a record of the average power consumed during a given pass. This measurement, which is reliable, makes it possible to determine the effect of the slightest cutting parameter on the yield.

At TMI there was no question of simulating milling operations; therefore, it was necessary to construct a machining facility capable of approximating the characteristics of TGV machining. The carriage can attain 50 meters per minute with an acceleration of 0.5 g; it is supported by a cushion of air virtually eliminating friction and permitting very fast feeds. The machine bed, of tubular concept (square or rectangular cross-section) makes the structure light but rigid with a good rate of vibration absorption and good cutting performance.

Experiments made with Dassault using the AU4G have now made it possible to determine the effect of cutting angles, feed and type of cut on the yield in terms of chip volume per minute and kilowatts consumed. According to Andre Greffiez, it has been noted that the effect of high speed is appreciable, since, under the best conditions at present, we obtain 81 cubic centimeters per minute per kW compared with 58 for conventional machining (a gain of 40 percent). Moreover, we should note that TGV machining uses a highly variable (and therefore low yield) slip-ring motor and that the results recorded take absorbed power into account and not effective power.

Moreover, so-called conventional machining is performed at 6,000 rpm and at 3 meters per minute, which are exceptional conditions for machining aluminum. The machine used for this experiment is specially designed to work on this material. In the near future, trial runs with different parameters are expected to make it possible to evaluate the characteristics of actual motor powers to obtain still greater knowledge of cutting stresses, for perfection in TGV cutting tools is unfortunately not on a par with conventional cutting tools, and we expect to make still greater progress in this aspect.

The study of cutting characteristics and the determination of proper tools are being assured by the Dassault company which, besides having an abundance of experience in aeronautical machining, has excellent analytical facilities (micrography of chips, and so on). Moreover, the study of cutting offers great objectivity with regard to the choice of tools for the experiments. In fact, the experiments are being made with double-edged helical carbide milling cutters from various sources, some of which are Rito, Planche and Reine. But the development of tools for TGV machining requires many trial runs while varying the characteristic angles on the tools almost one to one; this is a long-range project which few toolmakers want to undertake. With regard to carbide tool manufacturers, it seems that in 1980 (at the IMTS in Chicago) Valenite Modco

performed a TGV machining operation at its stand with a hub-type milling cutter of its own manufacture; but up to now, no information leads us to think that this firm carried on further experiments in this regard or that any other carbide tool manufacturers have engaged in that undertaking.

It is an undertaking which, to sum up what we have said, should, however, end up in industrial application. In any case, the industrialists involved will derive benefit and, at the least, experience: more effective numerical control (the battle is now between Num and Elsag), different concepts of machine tools, high frequency measuring devices and, of course, the development of ever more effective cutting tools.

8568
CSO: 3102/212

SECMAI: HIGH TECHNOLOGY MACHINERY MANUFACTURING FIRM

Paris MACHINE MODERNE in French Mar 82 pp 15, 17

[Article: "Automation: SECMAI--From Mechanics to Drafting in CAO"]

[Text] In the beginning SECMAI [Industrial Machinery and Equipment Study and Construction Company] was a study office for mechanical projects. The company made a first turn in 1967, planning and building for Thomson a machine with numerical programming for punching printed circuits, then producing its first machines with numerical programming for reading blueprints, photographic layouts and drilling. A second turn was taken in 1972, when SECMAI introduced data processing in its systems. Two years later the company launched its initial modular systems: It was to retain the principle of modules for its interacting systems with basic modules making it possible to handle alphanumerics and graphics such as those involving connected blueprints and on the basis of which it was possible for SECMAI to progress from DAO [computer-assisted design] to CAO [computer-assisted plan]. Capable of innovating and adapting to a market in constant evolution, SECMAI has made a mark in an advanced sector: That of equipment for the handling and layout of printed circuits.

With the experience acquired in the planning and production of equipment for the handling and layout of electronic circuits, SECMAI has applied its DAO and CAO systems to all the other fields in which graphic handling and alphanumerics are important: hydraulics, pneumatics, public works, architecture and so on, and now electrical research and development.

From Graphic Blueprints to Connected Graphics

In a general way, SECMAI today has perfected its low and intermediate range products with high technology. Four types can be distinguished: machinery with numerical programs for punching printed circuits, operating machinery with numerical programs (photo-stamping equipment), factory-ready data processing systems of single-station or multistation DAO and CAO for the printed circuit and blueprint industry, and special machinery. It is with its numerical program machinery for the punching of printed circuits that SECMAI has moved away from the field of mechanics proper. Mechanics no longer represents more than a small amount of the company's sales. Patented in France but also in the United States, the laser phototracing equipment of SECMAI makes possible the accurate and economic manufacture of films used in the production of printed circuits as well as basic documents used in blueprinting before the production

of microfilms. The systems developed by SECMAI are planned according to the principle of modules, so much so that it is possible to move from DAO to CAO by adding functional modules. They are applicable, then, both to blueprint graphics proper, which originates with DAO and where the worker controls the operations of the equipment, and to the "connected" blueprints which, on their part, derive from CAO, the worker merely giving the machine the signal to begin. In all cases, their goal is to reduce the time necessary for designing or planning blueprints while increasing the viability and quality of the finished product, reflected on one hand by an increase in productivity--ranging from an increase by a factor of 2 to an increase by a factor of 10 depending on the systems and types of work--and on the other hand by an enrichment of tasks leading to greater creativity. Indeed, it is known that blueprinting represents approximately 70 percent of the activities of study offices (25 percent, then, being devoted to planning and 5 percent to pure research). Built to order as a function of specific invitations to bid, special equipment represents some 5 percent of SECMAI's activities.

Succeeding While Remaining Independent

SECMAI, whose turnover increases from 30 to 50 percent each year, was awarded the Richard Medal in October 1981 by the Board of Directors of the Society for the Promotion of National Industry; and because of that SECMAI plans to continue its development and expand the range of its techniques and equipment while retaining its independent status. It is alone in planning electronics, data processing, and mechanics involved in its systems, whose mechanical assemblies the company undertakes itself. But SECMAI is also involved in hydraulics, pneumatics and optics. SECMAI calls on an outside construction firm only for the manufacture of mechanical parts, the supply of data-processing equipment, and peripheral equipment. SECMAI's personnel consists of technicians graduated from the major professional engineering schools and able to master the most diversified and most advanced technologies, with a common philosophy based on the notions of modules and interaction.

Very recently CIMSA [Military, Space, and Aeronautical Data-Processing Company], an affiliate of Thomson, ordered from SECMAI a compact multistation CAO color system, type RS 4140, for the handling of electronic circuits--remarkably complex because of specific restraints--used in its products. One will also recall that SEMS [European Mini-Data-Processing and Systems Company] will acquire a high-technology SECMAI 4140 + RS 4140 system (what is involved is a multistation color system with two computers) so as to handle cards with up to 650 elements.

Statistics on SECMAI

Established on 1 January 1948, SECMAI has a capital of 120,000 francs. It is headed by Francis Orth (chairman of the board and president) and Andre Frehling (director of technology and research). Located at Alfortville, it has two production facilities with an area of approximately 1,500 square meters (50 percent plant and 50 percent office space) and a staff of 28. Its turnover which was 7,637,000 francs in 1978 increased to an estimated 16 million francs in 1981. Its ratio of exports to total sales ranges from 5 to 10 percent while research represents 10 percent.

2662
CSO: 3102/211

CAD/CAM IN AUTOMOBILE TOOL MANUFACTURING

Wuerzburg AUTOMOBIL-INDUSTRIE in German Mar 82 pp 39-41

[Article by Wilhelm Hensmann: "CAD/CAM in Automobile Tool Manufacturing"]

[Text] The making of car body tools has always been known as a difficult and time-consuming task because of the expensive modification and adaption work involved. The development of CAD systems and the use of NC techniques for production and testing purposes offers the possibility of formalizing the work and rationalizing the whole process through the multiple use of stored work piece information. The programmer takes the place of the template cutter. A large computer system with graphics terminal is employed. In the report presented here the exchange of data between a CAD system, a numerically controlled measuring instrument and an NC milling machine for the manufacture of templates, models and tool contours is described.

CAD (Computer Aided Design) describes the entire field of activity where computer systems are employed for the work preparatory to manufacturing. Automatic plotting of drawing, which, however can only be carried with a relatively expensive hardware configuration and complex software systems, has proved to be an area of major importance. But calculating and test programs in the area of construction are equally a part of CAD work. The entire field of computer application in manufacturing is called CAM (Computer Aided Manufacturing). The area of emphasis is NC technology and/or programming. The terms CAD and CAM are often used together, since the tasks they deal with often blend into one another. Efforts are being made to achieve multiple processing of data that haa been stored, that is, additional use of parts drawings in the computer's internal memory. Digitized geometry information is also to be used for manufacturing tasks, so that the programming of numerically controlled manufacturing equipment is also simplified. This article describes an installation in which a link between CAD and CAM was achieved to a large degree.

1. Development of Work Methods

Plans on film--that is, lines drawn on wrinkle-resistant film with extreme accuracy, but not provided with dimensions--templates, models, duplicating milling machines and a great deal of work done by hand characterized the manufacture of body tools for decades, and to some extent they still characterize it today.

When NC technology became available about 10 years ago, with high-output NC machines, NC controls and NC programming methods, it was put to use by all automobile manufacturers to speed up the steps in the production of templates and models, and also in manufacturing tools.

Manual work in the shop was replaced by the work of a machine, the programmer took over from the template maker. Because of the complicated forms involved, programming from the outset was possible only with the help of a large computer, that is, CAM became part of automobile tool construction. The next step was to delegate additional tasks to the computer which had been carried out by hand by the template maker and the model builder, to be exact, the creation of contour lines between given points and the creation of smooth surfaces between these lines. This specialized area, which forms part of CAD because of the methods employed, substantially expanded the spectrum of NC programming possibilities. The goal, however, was clearly the manufacture of parts, not design and the plotting of drawings.

Not until recently have the possibilities existed of speeding up design with the help of the computer. As a consequence of graphics screens, less expensive computers and, above all, constantly improved software it is becoming possible to use CAD both during the design of the product as well as during the design of the tools and equipment for the product.

The economic advantage will lie principally in the possibility of rapidly retrieving stored data for the subsequent steps. Using the data, which describe the product in lines and surfaces, for the production of contours and surfaces for the tools, and taking over data from CAD tool construction for the milling, drilling and turning of fixtures and functional parts raises the possibility of a work sequence in which the precision of the tools depends essentially only on the precision of the NC machines.

2. Configuration of the Installation

The entire installation for the computer-assisted production of models and tools is composed of the following components, whose data link is shown in figure 1.

Large Computer

Because of the large volume of data which must be accessed at the same time, tasks in the CAD/CAM area, where digitized drawings must be manipulated, require an EDP unit with a suitably large memory capacity in the working memory and in the peripheral units. Access to the computer is usually a "time-sharing operation," that is, it is used simultaneously by several persons for different problems. Access is by means of screen terminals, some of which are set up as graphics terminals. The surface programs are programmed and checked over the graphics screen (fig. 2).

NC Drafting Machine

This is a combined numerically controlled drafting and digitizing machine (fig. 3). This part of the installation serves to prepare and check the data. It is linked to the main computer and is itself provided with a graphics work station (fig. 4). There is no direct data link between the measuring and the drafting machine, rather the measuring data are transmitted by punched tape. The punched tape is checked by the drafting machine before it is processed by the milling machine controls.

NC Measuring Machine

The measuring machine (fig. 5) receives data and checks data already in storage. It measures contours and shapes against master data and, particularly for cutting contours and supplemental surfaces, it supplies measurements to programming by way of the drafting-digitizing machine.

NC Milling Machine

The templates, models and tools are made on an NC milling machine, whose equipment and size are suited to the manufacturing task (fig. 6).

3. Economy

Because of the high investment costs, it is important that all the installations operate full-time in two shifts. This is possible because both models and templates as well as tools are manufactured. The NC drafting unit also checks NC programs from equipment construction and provides tool construction with data. Following a pilot phase, each step was adopted in practice only when its economy had been proved. Time savings of between 30 and 50 percent and cost savings of between 5 and 10 percent were achieved in the manufacture of templates, models and contours of all kinds in tools. Surface milling in tools and construction at CAD work stations are still in a pilot stage. Subsequent data on economy are not yet available, but it can be considered certain that the important point for economy is in the one-time generation and rapid transferral of data. The time savings at CAD work stations lie not so much in the construction process, at least not of the order that any economy would result with the high investments of about DM 400,000 per job, but in the multiple use of data that has been stored in the memory. The data can be data about the shape of the finished part, which, for example, have to be moved into other manufacturing situations, as well as data about standard parts.

4. Personnel

As this technology is still in a very turbulent process of further development, the demands made on the willingness of the workers to learn and continue their education are high. For parts programming it has proved to be worthwhile turning to very good skilled workers who have taken a technician's examination, for software development training as an engineer or qualification as a mathematician is mandatory. When estimating the capacity of the parts programmer, it must be considered that all NC programs are used only once.

The need for programs for the milling machines is higher than for normal NC machines, which are used for short production runs, by a factor of at least 10. This results in quite different proportions when planning staff numbers. Particularly in the plotting of templates and models, in which feed and advance motions are still very high, five programmers often have to set up programs for a single machine. In order to absorb peak loads, it is advantageous to blend this type of programming with the NC programming of production parts.

5. Working with Suppliers

Since a large part of the tools and equipment are not made in the company's own equipment and tool shop, but are ordered from suppliers, it is necessary to divide the work and prepare means of communication. It is possible, for example, to premill the original models and have the finishing carried out by a supplier. It is also possible to make drawings in rotated positions or reduced-scale drawings available to the construction companies. The exchange of punched tapes makes it necessary for the supplier to own the same kind of NC machine. Normalization of NC data, including data for NC measuring machines and NC drafting machines, is already well advanced. Modern controls recognize whether a punched tape is perforated in EIA [Engineering Institute of America] or in ISO [International Standards Organization] code. There needs to be some basic agreement about the format of punched tape.

CAD intersection points have not yet been normalized. Major American CAD users and suppliers are making initial efforts to define an intersection point (IGES--initial graphics exchange specification).

6. Future Developments

NC machines and NC controls have already reached a high technological standard. Five-axis machines will probably become increasingly important for the milling of surfaces, particularly in combination with CNC [Computer-Assisted Numerical Control] controls, which have large data banks and have the banks filled directly from the data administration computers. The strongest development can be expected in the area of software. This holds true both for the area of data handling from design to the finished tool and for CAD work stations.

There can be no doubt that development here is only at the beginning. Technically, the most serious problem for the field of automobile tool construction will probably continue to be the totally unsatisfactory size of the graphics screen. Anyone who can offer a solution here will find a ready market.

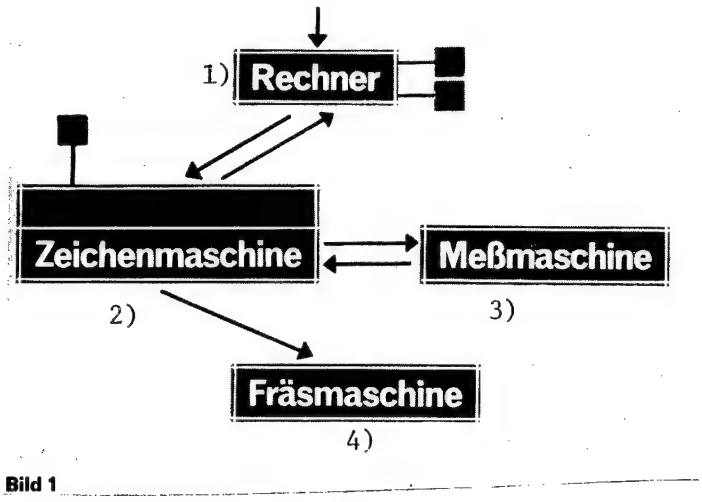


Figure 1. Data link between the components in the system

Key:
1. Computer
2. Drafting machine
3. Measuring machine
4. Milling machine

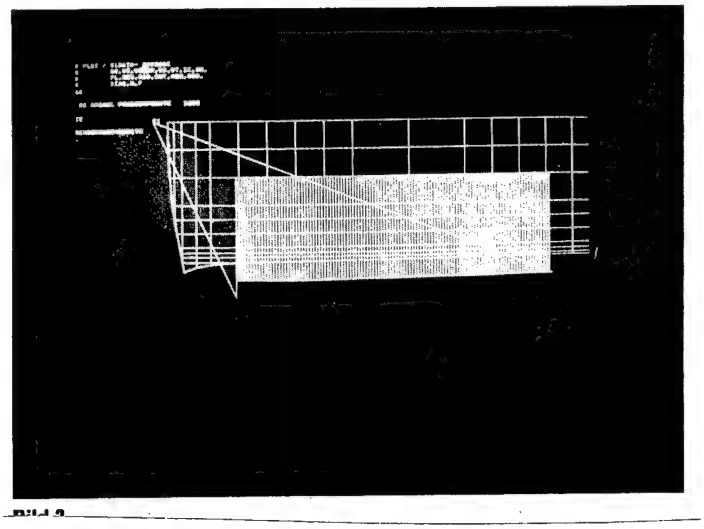


Figure 2. Surface program on the graphics screen

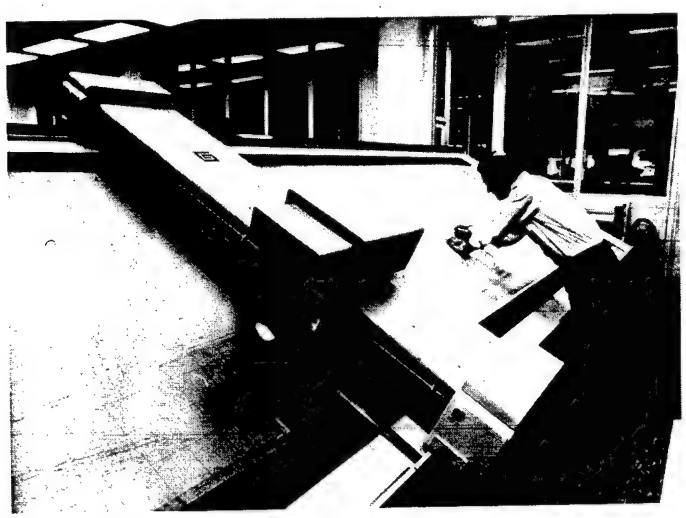


Figure 3. Combined drafting and digitizing machine

Figure 4. Graphics screen on the NC drawing unit

STATE TO AID INDUSTRIAL TECHNOLOGY WITH FUNDS FOR CAD/CAM

Copenhagen DATA-NYTT in Swedish 5 Apr 82 p 14

[Article by George Strachal]

[Text] Between 1980 and 1985 the Board for Technical Development (STU) will invest 40 million kronor to develop industrial technology. CAD/CAM is an important part of this development. During the 1982/1983 fiscal year about 3 million kronor will go to research at institutes of higher learning and slightly less to pure industrial development.

During 1983, aid to industry probably will increase and surpass research. STU's investment in CAD/CAM includes a plan to construct CAD/CAM centers at the institutes of technology in Stockholm, Goteborg, Linkoping, and later in Lulea and Lund. Borje Stark is in charge of this program at STU.

STU's involvement in the development of industrial technology with CAD/CAM represents a contribution by the state to a necessary technological development. STU entered this field when it began supporting certain research projects at the institutes of technology in Stockholm and Linkoping. These projects eventually evolved into pure research programs and in 1980 this support became a program for computer-assisted design and manufacture.

Companies Interested

The interest on the part of various companies became apparent when SAAB contacted STU in 1976. SAAB had acquired a Gerber-type CAD system. This system had excess capacity and SAAB wanted to offer it for some useful purpose.

From 1976 to 1978 STU offered training in this system to small companies. Since then STU has been involved in the so-called Malardal Project in which tool manufacturers have been able to learn about CAD/CAM.

"Recently we have noted rapidly increasing interest from small companies, among others," Borje Stark said. "At present, we are involved in a CAD/CAM program of a purely industrial nature. The Institute of Industrial Technology Research (IVF) will publish a report this fall entitled "CAD/CAM at Industrial Companies."

CAD/CAM Centers

In cooperation with IVF, STU intends to establish centers for research in industrial technology in Stockholm, Goteborg, Linkoping, Lund, and Lulea. Such centers actually exist already in Stockholm, Goteborg, and Linkoping. These centers will also have special CAD/CAM groups. Each group will consist of five persons involved purely with developmental work. The CAD/CAM groups will be an integral part of the industrial technology research.

"Our plans are being implemented already," Borje Stark said, "and agreements with the institutes of technology will be concluded in the near future. It must be remembered that this effort is above and beyond the present budget. What the government decides in the future is another matter."

"We cannot say today what the investment in these centers may yield. This can be done only after the government makes its decision. In addition, we are well aware that it may take time to establish the centers. Among other things, expertise is needed here which may not be so easy to find."

According to the preliminary program, STU believes that the following must be developed:

Knowledge concerning the principles of systems design and methods capable of describing the design and planning process as a basis for systems development.

Knowledge of computers, including peripherals and software.

Knowledge of principles for constructing workplaces and man-computer, terminal-computer, and computer-computer communications.

Geometric product and part models in computers, which are of vital significance for development.

Knowledge of how modern data-base technology may be utilized to make possible a desired development and knowledge of how the tools for constructing data structures may be used to describe the relationships involved in computer modeling.

Since these systems must be constructed as computer assistance to man, it is extremely important to develop communications technology that is adapted for human use.

Limitations in the flexibility of computer systems must be overcome with regard to product development and the development of production technology.

The modern tools of systems development must be learned for developing CAD/CAM systems.

"I believe that Sweden is in a good position by international standards," Borje

Stark said. "The rest of the world is interested in us as a possible partner. In addition, there is total unity among our politicians. They understand how important it is for Sweden to invest in further technological development in order to compete internationally.

9336
CSO: 3102/269

SWEDISH COMPANIES DEVELOP IMPROVED PIG IRON PROCESSES

Stockholm DAGENS NYHETER in Swedish 19 Apr 82 p 8

[Article by Lars-Ingmar Karlsson]

[Excerpts] While blast furnaces throughout the world are being utilized far below their maximum capacity, several large Swedish firms are hoping to sell processes that could complement or replace blast furnaces.

"Our methods are more energy-efficient and easier on the environment than the old blast furnaces with their large coking plants," they say.

The new Swedish pig iron methods have already attracted the interest of prospective customers, according to the firms.

Three new Swedish pig iron processes will compete with blast furnaces. Boliden wants to market its Inred method, SKF Steel its Plasmasmelt, and Asea and Stora Kopparberg their Elred.

"The three Swedish methods began to be developed at approximately the same time in the early seventies," said John Olof Edstrom, professor of production technology specializing in the mining and steel industries at the Stockholm Institute of Technology.

"One of the motivations behind the development was that Sweden wanted to continue pig iron production on a small scale."

"It is hardly feasible to construct blast furnaces with their coking and sintering plants for production below 1 million tons per year. The investment costs would be much too high."

Many Differences

It is in this area that the three Swedish methods are most advantageous. They simply skip one stage of the process. Coking and sintering plants are not used. The raw iron material is finely ground concentrate direct from the mine. The

Asea/Stora Kopparberg Elred process and Boliden's Inred also require no coke and, therefore no coking plant. SKF Steel's Plasmasmelt does require coke, but the quantities are small and no plant is needed.

In this way, the methods save energy. In addition, they do not pollute as much as blast furnaces with their coking and sintering plants. Thus, environmental regulations are more easily fulfilled.

In all three processes the iron ore concentrate has its oxygen removed, it is "reduced," in two stages. The procedures, on the other hand, are different.

In the first stage, Elred and Plasmasmelt have different types of so-called fluidized beds. Simply stated, these are beds that are kept floating, or are fluidized, by blowing compressed air from below.

In the Inred process coal powder is burned in an oxygen flame during the initial reduction.

In the second stage, Elred and Inred are most similar. Both methods employ heating with one or more electrodes that produce an intense electric arc. Both also produce a surplus of combustible gases. These are used to generate electricity.

Originally, the second stage of the Inred process used electric coils in the furnace walls for heating. This so-called induction heating now has been changed and electrode heating will be tested, instead.

Plasma Torch

Plasmasmelt utilizes a so-called plasma torch in its second stage. It is heated electrically and is capable of heating gas to several thousand degrees. This gas "cools" to just under 1,000 degrees during the final reduction, but it is still warm enough to heat the first stage.

Plasmasmelt receives its electricity supply from the ordinary power network.

SKF Steel also uses its plasma technology to produce so-called sponge iron. The raw material for this iron is a more highly refined form of ore, pellets, which are produced on a large-scale by LKAB (the LKAB Mining Company). The pellets are only partially reduced to a porous "semi-finished" pig iron.

Sponge iron works, or direct reduction works as they are also called, normally require an inexpensive supply of natural gas. SKF, however, has adapted its plasma technology so that the necessary gas can be produced from coal during the process itself.

"Sponge iron was developed originally in Sweden. Since then, it has been developed further in other countries. The number of sponge iron works is rising, especially in countries with a large supply of natural gas," John Olof Edstrom said.

Will Not Replace

But sponge iron is the raw material for only an extremely small portion of the world's steel--only about 2 percent. About 20 percent of the steel is made from scrap iron. The rest, almost 80 percent, is made from pig iron produced in blast furnaces.

The three Swedish pig iron processes promise iron that is 20 to 30 percent cheaper. John Olof Edstrom is more cautious in his estimate and believes that production costs may be reduced by 10 to 20 percent.

"We are a long way from replacing the blast furnace with these three processes. Blast furnaces have been made better and better and they are now as energy-efficient as theoretically possible," he said.

In addition, pig iron from blast furnaces is well suited for subsequent steel processes.

"The Swedish methods would be most beneficial at existing iron works where an increased capacity is desired. An increase of several hundred thousand tons of iron annually is possible."

Compared

John Olof Edstrom has compared the three methods and examined the significance of electricity prices, among other things.

"On a small scale with a production of several hundred thousand tons of iron annually where cheap electric power is available, Plasmasmelt is most profitable. It is also easiest to implement, since it does not generate its own electric power."

With higher electricity prices and in plants producing about 1 million tons, Elred is best. In both cases, Inred is between Elred and Plasmasmelt.

The advantage of both Elred and Inred is that these methods generate their own electricity. This could be important in certain cases, for example where the outside electricity supply is undependable.

"In Sweden and many other industrialized countries electric power is cheap and Plasmasmelt has certain advantages," John Olof Edstrom said.

He said that pig iron from Plasmasmelt is most like iron from blast furnaces, but the method that should be chosen is wholly dependent on local conditions and raw materials.

"All the methods have their advantages. It is too early to rule out any of the processes," he said.

Sweden Ahead

Despite their advantages of energy efficiency and compatibility with the environment, the three Swedish processes have found few eager customers. Estimates on the overcapacity of iron from blast furnaces vary, but it probably is at least 10 percent.

Sweden probably has a slight head start since the new processes are most highly developed here, but other countries are on the way and certainly will produce their own processes as energy and environmental requirements become more stringent.

The companies themselves are extremely optimistic. They hope that better iron and steel markets will increase the need for their methods.

"Recently we have noted a newly-awakened interest in Elred," Evert Wijkander of Asea said.

Elred has been tested on a small scale for several years. At present, Elred is not being tested, but further experiments are planned along with prospective customers abroad.

"We believe we can construct plants for 200 to several million tons of pig iron each year. A suitable capacity for the first plant would be between 300 and 500 thousand tons," Evert Wijkander said.

After 1985

"Such plants could be in operation after 1985."

A new pilot plant for Boliden's Inred process will begin operating in several days. Hans Elvander, who is responsible for the Inred technology, believes that once this plant has been tested larger plants could be built, preferably with a capacity of about 400 tons.

"We hope that during the spring of 1983 we will be able to quote a price for an Inred plant to a North American firm that is interested in the method," he said.

SKF Steel also is discussing the sale of its Plasmasmelt process to customers outside Europe.

"Two customers we are negotiating with could even purchase plants with 250,000 ton capacities before we have conducted experiments with larger plants," Sven Santen of SKF Steel in Hofors said.

Other Applications

So far experiments are being conducted with an annual production of only several thousand tons. It is hoped that in several years a pilot will be

produced with an annual capacity of 60 to 70 thousand tons.

"This size is commercially marketable for applications other than pig iron production. We also are using plasma technology to recover metals from flue gases and to produce ferrochromium," Sven Santen said.

There is already one commercial application of the plasma torch. It is in the company's own sponge iron plant in Hofors. The plant was converted just over 1 year ago and it became profitable again after being down several years. SKF also hopes to sell its sponge iron method, or Plasmared as it is called, to other firms.

In Plasmasmelt, as in Elred, the two stages have not yet operated concurrently. Concurrent operation should cause no problems, however, according to SKF Steel and Asea/Stora Kopparberg.

9336
CSO: 3102/253

SCIENCE POLICY

TWO INDUSTRIES DELETED FROM CODIS, TWO ADDED

Paris L'INDUSTRIE DU PETROLE GAZ-CHIMIE in French Jan-Feb 82 p 52

[Article: "Offshore Drilling Is No Longer Part of the CODIS Program"]

[Text] The Ministry of Industry has just entrusted to CODIS [Interministerial Committee for the Development of Strategic Industries] two new subject areas: Molecular chemistry and engineering goods and services, which have just replaced mass consumption electronics and offshore drilling, both of whose present status is considered to be satisfactory (see L'INDUSTRIE DU PETROLE GAZ-CHIMIE, No 537, p 5).

Molecular chemistry represents a state-of-the-art activity that is sharply on the rise, stimulated by its connections with other advanced activities (electronics, energy, aeronautics, public health). But in France it holds an insufficient share for an industrialized country. CODIS proposes to increase the growth rate of molecular chemistry by important measures bearing on research, investments and industrial structures.

As for the engineering goods and services sector, it is still underexploited and still threatened by major American and Japanese groups which dominate the market and by new competitors able to offer more advantageous prices.

The government's goals will thus be as follows:

1. To increase the establishment of French engineering goods and services in the industrialized countries, especially in the United States and Japan;

2. To improve capabilities of cooperation with French contractors (or operators) (public sector and private sector, domestic market and export market);

3. To play a more important role in the improvement of research;

4. To become organized to sell profitably the engineering goods and services of the intermediate industries and more modest sized projects;

5. To penetrate the new markets of Asia and Latin America more effectively without, however, losing the share of activity maintained so far on the African continent;

6. To meet the challenge of worldwide competition in engineering goods and services through the energetic development of the methods and tools of the profession.

Let us recall that CODIS was established in 1980 to encourage the development of future industrial activities. It includes seven industrial sectors: In addition to the two mentioned earlier, robotics, office computers, bioengineering, energy conservation and textiles.

2662
CSO: 3102/209

DRAFT LAW ON RESEARCH, TECHNOLOGY PRESENTED

Paris L'USINE NOUVELLE in French 4 Mar 82 p 53

[Article by Pierre Virolleaud: "Research and Technology: After the Rhetoric, Action"]

> [Text] The development of industrial technology is slated to be one of the major beneficiaries of the strong impetus to be given to research. With a budget representing 2.5 percent of the Gross Domestic Product, the government will have the means to pay for its goals.

The draft law on "orientation and programming" which French Minister of Research and Technology Jean-Pierre Chevenement was scheduled to present at the meeting of the Council of Ministers last Tuesday is the expected sequel to the extensive national debate organized around regional meetings and the national conference. It confirms a general goal: Over 3 years to bring outlays for research and development to 2.5 percent of the Gross Domestic Product, thanks especially to the research carried out by enterprises, which will reach 1.5 percent of the Gross National Product; this implies growth of 8 percent a year in funding by enterprises. On its part, the civilian research and development budget will increase at an annual rate of 17.8 percent.

The draft bill also specifies the measures to be undertaken. Industrial activities approved among the economic, social, and cultural issues assigned for completed research are as follows: Agrofood, raw materials, robotics, mechanics, materials, molecular chemistry, biomedicine, scientific instrumentation, drugs, engineering and engineering goods, lumber sector, and land transportation.

The draft bill calls for the continuation of the major civilian programs (nuclear space, aeronautic, ocean) and lists what the seven new "core" programs will be--programs in which public research organs, domestic enterprises, and the research centers of private firms will participate. This list will be updated each year.

The new "core" programs are:

1. Rational utilization of energy and energy diversification;

2. Biotechnology advances;

3. Mastery over the development of the electronics sector;

4. Scientific research and technological innovation in the service of Third World development;

5. Research on employment and the improvement of working conditions;

6. The promotion of French as a scientific language and the generalization of scientific and technical culture; and

7. Technological development of the industrial network.

So much for programming. As far as orientation goes, one will note especially the expressed wish contained in this draft bill to facilitate free interchange of persons and teams among organizations, in higher education, and in enterprises. Two new legal units will facilitate the implementation of this law.

Scientific and technical public enterprises will offer flexible administration and sizable capabilities for improvement, namely, through the creation of affiliates. Analogous to the GIEs [Economic Interest Groups], the GIPs [Public Interest Groups] will bring private and public partners together for a specific period, with the public partners in the majority.

2662
CSO: 3102/209

BRIEFS

CONTROL OF TECHNOLOGY TRANSFER--France has just established a committee for "extremely rigorous" control over technology transfers, specifically to East European countries, it was reported at the Ministry of Defense. The same source notes that France is "one of the European countries best equipped to exercise extremely strict control" over technology transfers. This committee, placed under the direct control of Premier Pierre Mauroy, operates with the direct participation of the Ministry of Defense, the Ministry of Foreign Affairs and the General Secretariat of National Defense (SGDN), it is reported. A new control procedure was established, explained Minister of Defense Charles Hernu, so that French advanced technology, at times ahead of American technology, may be completely protected. This "strictly French" procedure, which distinguishes France from some other European countries, covers all transactions, even civilian ones, which may have spillover effects in the military domain, the minister added. However, this procedure is separate from the control of another organization, COCOM [Coordinating Committee] this one international, of which France is a member. Charles Hernu pointed out that France is thus equipped with two procedures for technological protection, that of COCOM and its own. This protection is additionally reinforced by the new executive of the directorate of security-defense protection, which replaces military security and whose mission is to insure the security of French industries and concerns deemed to be "sensitive" as well as of their personnel. [Text] [Paris AFP SCIENCES in French 18 Feb 82 p 8] 2662

CSO: 3102/209

FRANCE, ITALY SIGN AGREEMENT FOR ATR 42 PROJECT

Milan IL GIORNALE NUOVO in Italian 29 Apr 82 p 24

[Text] Rome, 28 April--By the end of 1985, Aeritalia and Aerospatiale will start the first shipments of the "ATR-42"; the abbreviation means "42-seat regional transport aircraft." The preliminary studies were completed months ago and quite naturally led to yesterday's signing of the memorandum of understanding between the Italian and French governments.

The aircraft will cost a little bit less than 8 billion lire in present-day lire; it will be equipped with two Canadian Pratt and Whitney engines which will generate a total capacity of 3,600 horsepower; it will have a range of 1,300 kilometers; it will be able to carry 42 persons although a 49-seat version is also planned.

The builders--Aeritalia and Aerospatiale--believe that the world market for these short-range and limited-capacity aircraft will come to about 2,000 airplanes over the next several years. The Italian-French initiative is designed to capture a third of this demand which means building and selling about 700 aircraft over a period of several years with a total billing volume of very close to 5.5 trillion lire. The sale of the aircraft has been entrusted to a 50-50-held company called GIE (Economic Interest Group) with headquarters at Toulouse.

The division of labor among the two partners calls for Aeritalia to build the fuselage and the tail assembly at its Pomigliano and Arco plants, while Aerospatiale will build the wings at Toulouse and will be responsible for assembly. The added value will be exactly divided in two equal halves and the same is true of the sales proceeds. The prototype is expected to fly in August 1984.

The agreement signed between Italy and France also calls for an interesting possibility: Aeritalia might be called upon to join the British-French-German consortium which built the Airbus A-300-B-4, which is building the smaller version of the A-310 and which is getting ready to build the A-320. Italian participation, to be decided within the next 3 months, would involve this latter aircraft.

5058
CSO: 3102/265

BRIEFS

BRITISH LEYLAND, HONDA AGREEMENT--Honda and British Leyland have extended the technical agreement worked out in 1979 and signed an agreement for the joint development and production of a new 2,000-cubic centimeter luxury car. The joint production announcement was made in Tokyo by Honda President Yoshiki Kawashima. The new model, called "BL-Honda," is to be based on the blueprints of the new "LC-10" by BL [British Leyland] and a new, more powerful version of the "Accord 1800" by Honda. Honda and British Leyland would each--according to the terms of the agreement--produce the respective versions for sale on the Japanese, European, and American markets, probably starting in 1985. The models would therefore differ in terms of their outward appearance even though they would have the same engine and the same mechanical parts. The sales organization for the United States market will be similarly independent. The cost of developing the project will be divided among the two partners who however do not intend to extend their cooperation to capital "partnership." Nissan, which is studying the construction of a facility in Great Britain with an investment of 200 million Pounds Sterling, has made it known that it does not think it has to modify its plans following the agreement between BL and Honda. [Text] [Turin ATA in Italian Jan 82 p 5] 5058

CSO: 3102/265 END